CLAIMS

What is claimed is:

1. A linear acceleration system comprising:

one or more accelerating stages along an axis of the system; and

a first unipolar electrostatic quadrupole lens in series with the one or more accelerating stages that focuses an ion beam in a direction transverse to the axis.

2. The system of claim 1, wherein the first unipolar electrostatic quadrupole lens comprises four generally equally spaced electrodes that generate electrostatic fields transverse to the axis.

3. The system of claim 2, wherein a first pair of the electrodes are located opposite each other and biased to ground.

4. The system of claim 3, wherein a second pair of the electrodes are located opposite each other and biased to a negative potential.

5. The system of claim 3, wherein a second pair of the electrodes are located opposite each other and biased to a positive potential.

6. The system of claim 2, wherein a first pair of the electrodes are selectably biased to one of ground and a first potential.

7. The system of claim 6, wherein the first potential is positive.

8. The system of claim 1, further comprising a second unipolar electrostatic quadrupole lens in series with the first unipolar electrostatic quadrupole lens, wherein the first lens focuses in a first direction and the second lens focuses in a second direction that is generally perpendicular to the first direction.

9. The system of claim 1, further comprising a low energy ion beam that travels along the axis and is shaped by the first unipolar electrostatic quadrupole lens without a substantial loss of beam current.

10. The system of claim 9, wherein the low energy ion beam is at an energy level of less than about 90 KeV.

11. The system of claim 9, wherein the low energy ion beam is at an energy level of less than about 20 KeV.

12. An electrostatic quadrupole lens comprising:

a first pair of electrodes located opposite each other, connected to a low resistance path to ground;

a second pair of electrodes located opposite each other, wherein the first pair of electrodes and the second pair of electrodes are equally spaced about a center point, the second pair of electrodes biased to a first potential.

13. The lens of claim 12, wherein the first potential is positive.

14. The lens of claim 12, wherein the first potential is negative.

15. An electrostatic quadrupole lens system comprising:

a switching circuit controllably connected to ground and a first voltage potential;

a first pair of electrodes located opposite each other, connected to the switching circuit;

a second pair of electrodes located opposite each other, wherein the first pair of electrodes and the second pair of electrodes are equally spaced about a center point, the second pair of electrodes biased to a second voltage potential.

16. The system of claim 15, wherein the first voltage potential is positive and the second voltage potential is negative.

17. The system of claim 15, wherein the first voltage potential is negative and the second voltage potential is positive.

18. The system of claim 15, wherein the switching circuit is part of a power supply that provides the first voltage potential to the first pair of electrodes.

19. A method of operating an ion implantation system, comprising:

extracting an ion beam from an ion source;

determining whether a desired ion beam energy is greater than a first threshold; and

configuring a quadrupole lens along a beam path of the ion beam in one of a bipolar configuration or a unipolar configuration based on the determination.

20. The method of claim 19, wherein the quadrupole lens is configured in the unipolar configuration if the desired ion beam energy is less than the first threshold.

21. The method of claim 19, further comprising determining whether the desired beam energy is greater than a second threshold, wherein the second threshold is less than the first threshold.

22. The method of claim 21, wherein the quadrupole lens is configured in the unipolar configuration if the desired ion beam energy is less than the second threshold.

23. The method of claim 22, wherein the quadrupole lens is configured in the unipolar configuration or the bipolar configuration is the desired ion beam energy is greater than the second threshold and less than the first threshold.